B3 cont e' Cnt g) agglomerating the product of step f) into a desired biscuit shape.

Please add the following Abstract:

The present invention provides an improved breakfast cereal biscuit comprising grain which includes waxy grain in an amount of at least 20% by weight of total grain content. The grain has been hydrated and cooked either sequentially or simultaneously, rolled into flakes, and either agglomerated and toasted into a desired biscuit shape or toasted and agglomerated into a desired biscuit shape. A process for the production of the improved breakfast cereal biscuit is also provided. The improved breakfast cereal biscuit typically exhibits extended bowl life, has improved nutritional qualities, is tender and crisp in texture, has better flavors, and requires reduced energy in the manufacturing process, when compared to standard flaked wheat breakfast cereal biscuits.

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REMARKS

In the Official Action dated May 24, 2002, Claims 1-22 are pending and under consideration. The application is objected to for lacking an abstract of the disclosure as required by 37 C.F.R. 1.72(b). Claims 2 and 12 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. Claims 1-22 have been rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 5,391,388 to Lewis et al. ("Lewis et al.").

This Response addresses each of the Examiner's rejections and objections. Applicants therefore respectfully submit that the present application is in condition for allowance. Favorable consideration of all pending claims is therefore respectfully requested.

The application is objected to for lacking an abstract of the disclosure as required by 37 C.F.R. 1.72(b). In response, Applicants have provided an Abstract on a separate sheet in compliance with 37 C.F.R. 1.72(b).

Claims 2 and 12 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. The Examiner contends that the terms "sequentially" and "simultaneously" cannot be used in the same step of the claimed method.

In response, Applicants have cancelled Claims 2 and 12 without prejudice. The subject matter of Claims 2 and 12 is now delineated in new claims 23-28. The methods of Claims 23 and 26include the step of *hydrating and cooking sequentially*. The methods of Claims 24 and 27 include the step of *hydrating and cooking simultaneously*. The methods of Claims 25 and 28include the step of partially hydrating prior to cooking followed by balancing moisture during the cook phase. These new claims are supported by original Claims 2 and 12 and the description throughout the specification, for example, at page 7, lines 13-15. Claims 14 and 22, which were dependent on Claim12, have been amended to depend on new Claims 26-28. No new matter is introduced by these amendments.

It is submitted that new Claims 23-28 are not indefinite. Accordingly, the rejection of Claims 2 and 12 under 35 U.S.C. 112, second paragraph, as allegedly indefinite is overcome and withdrawal thereof is respectfully requested.

Claims 1-22 have been rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Lewis et al.

Applicants observe that Lewis et al. merely teach a cereal food product for hot and cold usages, which product comprises a "waxy" cereal chosen from a variety of grains, most preferably waxy barley. The cereal food product according to Lewis et al. is preferably a

quick-cooking hot porridge-like breakfast food where the processed grain is formed into integral flakes, granules or flakes in subdivided form. Importantly, Applicants observe that the basis for the invention described in Lewis et al. is that the starch present in the grain is substantially *ungelatinized*. For example, Claim 1 of Lewis et al. states that no more than 30% of the total starch content in the grains is gelatinized. Applicant also observe that Lewis et al. disclose a low moisture content of the grain ranging from 15 to about 19.5% during the hydration and cooking steps. Applicants further observe that, during the cooking step, the grain is steamed only for about 7 minutes so as to minimize gelatinization of the grain and keep the moisture content low.

The Examiner concedes that Lewis et al. do not disclose forming cereal biscuit and hydrating to the moisture content as claimed in the present invention. However, the Examiner alleges that it would have been obvious to one skilled in the art to agglomerate the flakes disclosed by Lewis et al. to make the cereal biscuit as claimed in the present application. The Examiner also alleges that Lewis et al. disclose other products can be made from the grains. In addition, the Examiner contends that it would have been obvious to vary the hydrating time to obtain varying moisture content depending on the degree of softening desired and the variation of the subsequent processing steps.

In response, Applicants respectfully submit that both the cereal products and the processes described and claimed in the present invention are significantly different from what is described and claimed in Lewis et al.

In the first instance, Claims 1, 3-11, 22 and newly added Claims 23-25 are directed to an improved breakfast cereal biscuit ("BCB") and in particular, to an improved BCB comprised of grain which is at least 20% by weight waxy grain. Claims 13-21 and newly

added Claims 26-28 are directed to the processes in making the improved BCB, specifically, to the full gelatinization of grain having a high moisture content and longer cooking time at higher temperatures, as described at page 7-8 in the specification.

As described in the specification of present application at page 2, lines 20-25, waxy grains were not generally contemplated in the manufacture of BCBs prior to the present invention. Indeed, high moisture content and high gelatinization of grains increase the stickiness of processed grains. This often results in the formation of an undesirably glue-like material which causes problems in processing due to the grains sticking to surfaces of the cooking and processing apparatus. Because of the difficulties associated with processing waxy grain, non-waxy grain was not routinely used in the preparation of BCBs. In this regard, Applicants direct the Examiner's attention to a new publication, Fast and Caidwell, Eds. *Breakfast Cereals and How They are Made*, 2nd Edition, American Association of Cereal Chemists Inc., 2000 (selected pages attached hereto as **Exhibit A**). In this new edition at page 51, there is a brief discussion of "compressed-flake biscuits" where the state of the art is summarized and it is noted that only wheat was known as a processed product in the manufacture of such biscuits.

In Lewis et al., grain is only partially gelatinized, as disclosed by, for example, Claim 4 of Lewis et al., where less than 30%, and preferably less than 10% of the starch is gelatinized. Lewis et al. also teach that the low moisture content during the 7 minute steaming step (15-16% as described in Example 1) helps preventing the flakes from over-gelatinization and sticking together. See column 5, lines 39-51 of Lewis et al. This mild processing only increases the moisture content by an amount of about 3.5% to 19.5%. The

mild steaming conditions and the initial low moisture content in Lewis et al. ensure that no more than 30% of the starch of the grain is gelatinized.

Therefore, Applicants respectfully submit that the integral ungelatinized flakes prepared by the process of Lewis et al. cannot be used to form a biscuit, as the flakes would not adhere to each other.

In contrast to Lewis et al., the present invention makes agglomeration possible in the BCB. In accordance with the present invention, the grain is first brought up to 30% moisture, preferably about 29% moisture, as described at page 4, lines 11-12 of the specification and recited in Claims 9 and 19, and then cooked at temperatures between 100°C and 180°C, particularly, at about 125°C for 30-90 minutes, preferably for up to 90 minutes.

It is submitted that to achieve making BCB with waxy grains as claimed in the Claims 1, 3-11, 22 and newly added claims 23-25, the present inventors have found a process, as claimed in the Claims 13-21 and newly added claims 26-28, which allows the formation of cooked waxy grains to be rolled and then stuck together with minimal compression to form BCBs. Therefore, it is submitted that the BCB products and the methods of making thereof as instantly claimed, are not taught or described by Lewis et al.

Furthermore, there is no teaching or suggestion in Lewis et al. that would have motivated a person skilled in the art to arrive at the claimed processes or BCB products of the present invention. Lewis et al. disclose a totally different process and a cereal food product, and clearly do not teach or suggest manufacturing sticky processed grains, or preparing agglomerated BCB's based on the inherent cohesiveness of the processed grain. The rejection of claimed subject matter under 35 U.S.C. §103 requires that the suggestion to carry out the claimed invention must

be found in the prior art, not in Applicants' disclosure. In re Vaeck, 947 F.2d 488, 492, 20 U.S.P.Q. 1438, 1442 (Fed. Cir. 1991). Here, the suggestion to use the claimed methods to make the claimed BCB appears nowhere in the cited combination of prior art references. Therefore, Applicants respectfully submit that the BCB products and the processes for making such products, as instantly claimed, are not obvious in light of Lewis et al.

In view of the foregoing remarks and the amendments, it is respectfully submitted that the present invention is non-obvious in view of Lewis et al. Thus, applicants submit that the rejection of claims 1-22 under 35 U.S.C. 103(a) is overcome. Withdrawal of the rejection is respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the instant amendment, captioned "**Version with Markings to Show Changes Made.**"

In view of the foregoing amendments and remarks, it is firmly believed that the present application is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,

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FSD/XZ/ZY:sf

Enclosures Version with markings
Exhibit A
Abstract

"Version with Markings to Show Changes Made"

IN THE CLAIMS:

Claims 2 and 12 have been cancelled without prejudice.

Claims 14 and 22 have been amended as follows:

14. (Twice Amended) [A] The process [as claimed in claim 12] according to anyone of Claims 26-28 wherein said waxy grain is selected from barley, corn, wheat, rice and/or sorghum.

22. (Twice Amended) A breakfast cereal biscuit prepared by [a] the process of [claim 12] any one of Claims 26-28.

The following claims have been added:

23. (New) The breakfast cereal biscuit of claim 1 wherein the grain has been hydrated and cooked sequentially, rolled into flakes, and either agglomerated and toasted into a desired biscuit shape, or toasted and agglomerated into a desired biscuit shape.

24. (New) The breakfast cereal biscuit of claim 1 wherein the grain has been hydrated and cooked simultaneously, rolled into flakes, and either agglomerated and toasted into a desired biscuit shape, or toasted and agglomerated into a desired biscuit shape.

25. (New) The breakfast cereal biscuit of claim 1 wherein the grain has been partially hydrated prior to cooking followed by balancing moisture during the cook phase, rolled into flakes, and either agglomerated and toasted into a desired biscuit shape, or toasted and agglomerated into a desired biscuit shape.

26. (New) A process for producing a breakfast cereal biscuit comprising the steps of

a) selecting grain which includes waxy grain in an amount of at least 20% by weight of total grain content;
b) hydrating and cooking said grain sequentially;
c) rolling cooked grain into flakes; and either
d) agglomerating the flakes of step c) into a desired biscuit shape, and
e) toasting the product of step d); or
f) toasting the flakes of step c), and
g) agglomerating the product of step f) into a desired biscuit shape.

27. (New) A process for producing a breakfast cereal biscuit comprising the steps of

a) selecting grain which includes waxy grain in an amount of at least 20% by weight of total grain content;
b) hydrating and cooking said grain simultaneously;
c) rolling cooked grain into flakes; and either
d) agglomerating the flakes of step c) into a desired biscuit shape, and
e) toasting the product of step d); or
f) toasting the flakes of step c), and

g) agglomerating the product of step f) into a desired biscuit shape.

28. (New) A process for producing a breakfast cereal biscuit comprising the steps of

a) selecting grain which includes waxy grain in an amount of at least 20% by weight of total grain content;

b) partially hydrating grains prior to cooking followed by balancing moisture during the cook phase;

c) rolling cooked grain into flakes; and either

d) agglomerating the flakes of step c) into a desired biscuit shape, and

e) toasting the product of step d); or

f) toasting the flakes of step c), and

g) agglomerating the product of step f) into a desired biscuit shape.

The following Abstract has been added:

The present invention provides an improved breakfast cereal biscuit comprising grain which includes waxy grain in an amount of at least 20% by weight of total grain content. The grain has been hydrated and cooked either sequentially or simultaneously, rolled into flakes, and either agglomerated and toasted into a desired biscuit shape or toasted and agglomerated into a desired biscuit shape. A process for the production of the improved breakfast cereal biscuit is also provided. The improved breakfast cereal biscuit typically exhibits extended bowl life, has improved nutritional qualities, is tender and crisp in texture, has better flavors, and requires reduced energy in the manufacturing process, when compared to standard flaked wheat breakfast cereal biscuits.

Breakfast Cereals

And How They Are Made

Second Edition

Edited by
Robert B. Fast and Elwood F. Caldwell

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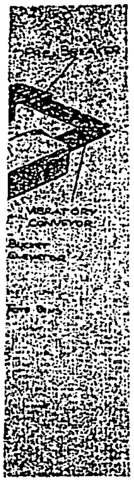

or expanding extrudate is usually done by a knife rotating on the outer face of the die. The extruded expanded pieces can be sugar-coated or colored and flavored to produce a variety of products for various tastes.

One early process for the production of an extruded expanded cereal was described by Fast et al (1971) and another by Rosenquest et al (1975). Many more exist. The use of extrusion for continuous cooking is covered in Chapter 3, and Chapter 6 is devoted in detail to extrusion and extruders in breakfast cereal manufacturing.

Baked Breakfast Cereals

Baked cereals were made before 1900, one of the early products being Grape-Nuts, developed by C. W. Post. The cereal was traditionally produced by baking loaves of bread that were cooled and ground to a granular form. The granules were then retoasted to the desired degree of flavor and moisture. The advent of twin-screw extrusion, enabling users to control and reduce the effects of gelatinization and shear, has resulted in these units being used in a continuous flow in place of loaf baking.

Another baked RTE breakfast cereal is made by the same rotary molding technology and equipment as are used by cookie manufacturers to form cookies of the shortbread or sandwich base-cake type. A dough made of ground grain materials, water, sugar, shortening, and flavorings is passed into the nip of two rolls, the rearmost of which carries around a layer of the dough mass and acts as a feeder to the front or die roll. The shapes to be formed are cut or engraved into the die roll in reverse. Running under (and compressed up onto) this die roll is a canvas takeaway belt or apron. The dough pieces in the die cups have greater adhesion to the canvas belt than to the die roll and are pulled away and deposited onto the apron. From there, they are transferred to the baking band of the oven and baked to final flavor and moisture.

Compressed-Flake Biscuits

Compressed-flake biscuits are just what the name implies—biscuits formed from the compression of previously cooked and flaked grains or grain mixtures with other ingredients. The flakes are usually made from wheat with added sugar, salt, and flavorings as described earlier in this chapter. One such product, made by Weetabix, Ltd., is well liked in the United Kingdom. Similar products are made in Canada

and exported to the United States, as well as being made and marketed in Australia.

Although the manufacturing process is proprietary, examination of the products indicates that the wheat has been precooked with sugar and other flavorings, dried, tempered, and flaked rather thin before being formed into the biscuit shape while still untoasted. The biscuits could be molded individually or the flakes sheeted into a mat of the desired thickness and then sawed into individual rectangular biscuits. After initial formation of the biscuits, they are dried and toasted to the desired color, flavor, and moisture content. Radio frequency ovens may be used to extract moisture from the biscuit centers.

Muesli-Type Products

These RTE breakfast cereal types are mixtures of several ingredients. In Europe, the major ingredient is otherwise-unprocessed rolled oats of the quick-cooking type mixed with other flavoring components and intended to be served and eaten as is, after the addition of milk and sugar but without further processing. In North America, the grain components are usually corn, rice, wheat, and/or barley flakes that have been processed in the same way as for making separate RTE flaked breakfast cereals. Rolled oats can also be a component. Brown sugar, crystalline or liquid sucrose or dextrose, and corn syrup may be used for sweetening, while raisins; dates; almond, walnut, or pecan slices or pieces; and salt add interest and flavor appeal.

The RTE grain flake pieces are kept to a small size to deter separation of the raisins, dates, and nut particles. An interesting aspect of these products upon visual examination is that they are obviously mixtures of as many as six or seven dry components. All of these must be fed individually to the finished product stream in their correct proportions and mixed before packaging, such that the finished cereal appears uniform. Modern high-speed scaling units are responsible for most of this technology.

Filled, Bite-Size Shredded Wheat Biscuits

A more recent arrival in the bite-size shredded wheat category is fruit jam-filled pieces. Inserting the jam into the pieces is done between shredding the wheat and forming the biscuits.

Most bite-size pieces are composed of about 10 layers of shreds of cooked wheat. To make jam-filled pieces, four or five layers of shreds are progressively laid down on the belt below the shredding rolls. At

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environment. Analysis of the transfer mechanism reveals an equation similar to that for drying (in reverse) and implying first-order reaction rates. It is an exponential function and can be assigned an activation energy (Lund, 1986). The resulting activation energies are of the same order of magnitude as those of gelatinization and appear to be interchangeable. These two views thus describe the same phenomenon.

One advantage of the moisture diffusivity model is that it allows prediction of the effect of particle size on cooking time. In general, diffusion equations predict that the cooking time should increase with the square of the particle size. This seems to agree with experience (in batch cooking of small versus large flaking grits, for example) and emphasizes the need for uniform particle size when diffusion dominates, as is the case in batch cooking and in short-time continuous steam cooking within a preconditioner. Small particles absorb moisture more quickly, starving large particles and leading to a nonuniform product. In extrusion, steam injection relies to some extent on diffusion processing, but is usually followed immediately by intense shearing that tends to equalize any moisture heterogeneity.

Operating Conditions for Typical Products

Despite the complexity of cooking reactions and the difficulty of predicting with any precision the conditions required to cook a cereal product satisfactorily, a pattern arises when the range of conditions actually employed in the industry is considered. All of the theory just discussed points to exponential relationships between time, temperature, and moisture, and the pattern persists over a wide range of conditions. The discussion that follows explores this pattern in semiquantitative terms.

To be of practical size, continuous cooking processes must operate at elevated temperatures, which reduce cooking time. Actual cooking methods follow this trend closely, ranging from more than 1 hr in boiling water (100°C) to only a few seconds at up to 350°F (180°C) in adiabatic extruders.

Water is a reactant in gelatinization, and it also affects the process time—gelatinization proceeds more easily in the presence of excess moisture. In cereal cooking, low-moisture processes are associated with high shear stresses, which also increase the reaction rate by mechanically disintegrating the starch granules, countering somewhat the low-moisture effect.

Water activity, not merely water content, is important. In our previous discussion of moisture migration, it was noted that sugar is less efficient as a plasticizer than is water alone, thus increasing the glass transition temperature T_g and delaying pasting. A more

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A more

traditional explanation of the effect of hygroscopic ingredients such as salt or sugar is that they compete with starch for moisture, reducing the effective concentration available for gelatinization and requiring higher temperatures or longer times to achieve the same results.

Either way, the actual time needed to cook cereal products is generally a function of both moisture (interacting with shear) and temperature. With these variables, a three-dimensional graph may be constructed to show all possible cooking conditions for cereals. The typical range of conditions for each of seven cooking processes is shown as an area on the overall operating surface in Figure 20A.

The operating surface is also convenient for illustrating the range of product characteristics from the cooking processes (Figure 20B). These are also generally functions of time, temperature, and moisture. Low-moisture, short-time cooking requires the highest temperature and results in a dry, puffed product, typical of adiabatic extrusion. Increasing the moisture and time decreases the temperature requirement, permitting puffing with higher moisture, typical of high-shear extruders with or without steam precookers. The high-shear extruder with a steam precooker can also produce a granular cooked product, similar to that of steam cooking, when operating under less severe conditions for a longer time. Steam cooking alone produces a granular product from a whole grain or granular feed, and boiling water is generally useful for whole grains, requiring a long cooking time at high moisture and low temperature. Low-shear, low-pressure processes, overlapping to a degree in operating conditions with the high-shear extruders, produce a granular product. Low-shear, high-pressure extruders produce a dense, moist product, which often forms bubbles of expanded water vapor but lacks a good puffed structure.

BOILING-WATER SYSTEMS

The use of boiling water in continuous cooking systems has not become an important method, primarily because of long residence times and the associated large equipment sizes needed. The advantages of continuous operation do not easily apply to boiling-water cooking, which has been used primarily for whole grain applications and where starch degradation must be absolutely minimized, as for shredded wheat.

Whole grain boiling usually requires a long holding time (at least several hours) after cooking to equilibrate product moisture within the grain. This is compatible with batch cooking, which is normally

used for these products, as already described in this chapter. Nevertheless, there has been some activity (Spiel et al, 1979; Fast, 1987) in developing continuous boiling processes for special purposes.

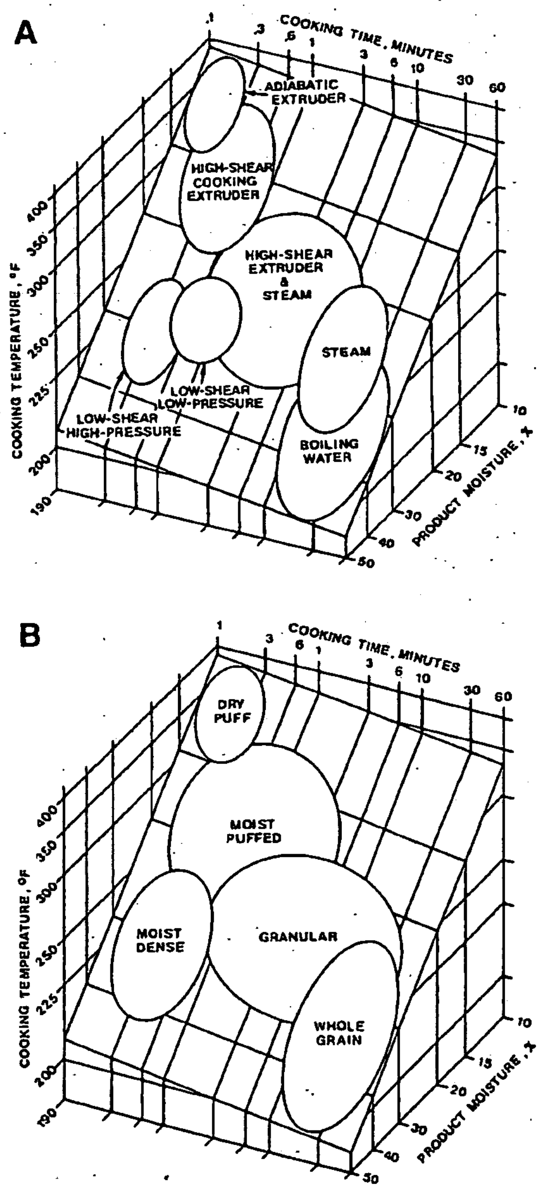

Figure 20. A, range of cereal-cooking conditions—time, temperature, and moisture—with typical ranges of cooking processes. B, product characteristics from different regions in the range of cooking process conditions.

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